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## (54) LAMINATED FILM AND CONDENSER USING THE SAME

(57)Abstract:

PURPOSE: To obtain a syndiotactic polystyrenic laminated film suitable as a dielectric film for a condenser, excellent in running properties and shaving resistance at the time of the production of the film or a condenser and improved in humidity resistance and self-healing properties at the time of the application of voltage.

CONSTITUTION: A laminated film is constituted by forming a surface layer composed of a polyester polymer to at least the single surface of a film composed of a styrenic polymer having a syndiotactic structure and adapted to the production of a condenser.

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## CLAIMS

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### [Claim(s)]

[Claim 1] A laminated film, wherein a surface layer which becomes at least one side of a film which consists of a styrene system polymer which has syndiotactic structure from a polyester system polymer is formed.

[Claim 2] the three-dimensional surface roughness SRa of a surface layer -- more than 0.01 (micrometer) -- and -- The laminated film according to claim 1 in which Slambdaa (micrometer) and glass transition temperature are characterized by satisfying the following relation.

$4+4 \times (T_{ge}-T_{gc})/T_{ge} \leq \lambda_{slamda} \leq 25+10 \times (T_{ge}-T_{gc})/T_{ge}$  -- here --  $T_{ge}$  -- the glass transition temperature  $T_{gc}$  of polyethylene terephthalate -- glass transition temperature of a surface layer [Claim 3]

The laminated film according to claim 1 in which glass transition temperature of a surface layer is characterized by satisfying the following relation.

$T_{gc} \geq 50 \times (1+Ae/A)$  -- here --  $Ae$  -- thickness A of a surface layer -- thickness of a laminated film [Claim 4]

The laminated film according to claim 1, wherein thickness of a surface layer is 30% or less of the thickness of a laminated film.

[Claim 5] A dielectric dissipation factor (25 \*\*, 1 kHz) of a laminated film is 0.001. The laminated film according to claim 1 being the following.

[Claim 6] A capacitor using a metalization syndiotactic polystyrene system laminated film which formed a metallic thin film layer at least in one side of the syndiotactic polystyrene system laminated film according to claim 1.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Industrial Application] This invention is a thing about the capacitor which used a laminated film and it, If it says in more detail, the performance traverse of the film at the time of manufacture of a film, and capacitor manufacture suitable as a dielectric film for capacitors, It is related with the syndiotactic polystyrene system laminated film and capacitor by which it excelled in \*\*\*\*\*-proof, and the moisture resistance at the time of a voltage overload and self healing nature were improved.

**[0002]**

[Description of the Prior Art] Since biaxial stretching and the biaxially oriented film which carried out heat setting have heat resistance and the good electrical property, the dielectric of the capacitor develops the resin composite which uses a syndiotactic polystyrene system polymer as the main ingredients (JP,2-143851,A, JP,3-124750,A, JP,5-200858,A). What was slippery for the improvement in performance traverse at the time of manufacture of a capacitor or the improvement in yield, and improved the sex is known (JP,6-29146,A , JP,6-80793,A).

**[0003]**

[Problem to be solved by the invention] However, in the syndiotactic polystyrene system film of these former, although improvement of \*\*\*\*\*-proof at the time of manufacture of a film and capacitor manufacture and performance traverse is found, About the moisture resistance at the time of the voltage overload of the obtained capacitor, and self healing nature, it cannot necessarily be satisfied.

**[0004]**

[Means for solving problem] This invention is a laminated film, wherein the surface layer which becomes at least one side of the film which consists of a styrene system polymer which has syndiotactic structure from a polyester system polymer is formed. the three-dimensional surface roughness SRa of this surface layer -- more than 0.01 (micrometer) -- and -- Slambdaa (micrometer) and glass transition temperature --  $4+4 \times (Tge-Tgc)/Tge \leq Slambdaa \leq 25+10 \times (Tge-Tgc)/Tge$  -- here, the glass transition temperature of that, as for Tge, the glass transition temperature Tgc of polyethylene terephthalate satisfies the relation of the glass transition temperature of a surface layer, and this surface layer --  $Tgc \geq 50 \times (1+Ae/A)$  -- here, As for Ae, in thickness A of a surface layer, the dielectric dissipation factor (25 \*\*, 1 kHz) of satisfying the relation of the thickness of a laminated film, that the thickness of this surface layer is 30% or less of the thickness of a laminated film, and a laminated film is 0.001. By being the following, The laminated film for syndiotactic

polystyrene systems in which controlled omission of lubricant at the time of manufacture of a film suitable as a dielectric film for capacitors and capacitor manufacture, and it excelled in performance traverse, and the moisture resistance at the time of a voltage overload and self healing nature were improved can be obtained. The capacitor using such a laminated film for syndiotactic polystyrene systems is excellent in an electrical property, and excellent in the moisture resistance at the time of a voltage overload, and self healing nature.

[0005]The tacticity used for this invention the polystyrene system polymer which is syndiotactic structure, It is desirable for the tacticity by which the phenyl group or substituted phenyl group which is a side chain is quantified with a nuclear magnetic resonance method to be not less than 50% of syndiotactic structure at die ADDO (a constitutional unit is two pieces) in not less than 85% and a pentad (a constitutional unit is five pieces).

[0006]As this polystyrene system polymer, polystyrene, poly (p-, m-, or o-methylstyrene), Poly (2,4-, 2,5-, 3,4-, or 3,5-dimethylstyrene), Poly, such as poly (p-tertiary-butylstyrene) (alkyl styrene), Poly (p-, m-, or o-chlorostyrene), poly (p-, m-, or o-bromostyrene), Poly, such as poly (p-, m-, or o-fluorostyrene) and poly (o-methyl-p- fluorostyrene) (halogenation styrene), Poly, such as poly (p-, m-, or o-chloromethyl styrene) (halogenation alkyl styrene), Poly, such as poly (p-, m-, or o-methoxy styrene) and poly (p-, m-, or o-ethoxystyrene) (alkoxy styrene), Poly, such as poly(carboxy alkyl styrene) poly (p-vinylbenzyl propyl ether), such as poly (p-, m-, or o-carboxymethylstyrene) (alkyl ether styrene), poly (alkyl silylstyrene), such as poly (p-trimethylsilyl styrene), -- poly (vinylbenzyl dimethoxyphosphide) etc. are mentioned further.

[0007]Especially in this invention, polystyrene is preferred in said polystyrene system polymer. The polystyrene system polymer which has the syndiotactic structure used by this invention, It is not necessary to be necessarily a single compound, and as long as syndiotacticity is said within the limits, a mixture, and copolymers and those mixtures with the polystyrene system polymer of atactic structure or isotactic structure may be sufficient. The weight average molecular weight of the polystyrene system polymer used for this invention is 50,000 or more still more preferably 10,000 or more. Weight average molecular weight cannot obtain the film excellent in the strong ductility characteristic or heat resistance in less than 10,000 thing. Although not limited in particular for the maximum of weight average molecular weight, since generating of the fracture accompanying the increase in extension tension, etc. arise, it is not so desirable at 1500 or 000 or more.

[0008]The syndiotactic polystyrene system film of this invention, Extension methods, such as length, width and the vertical extending method, width, length and the vertical extending method, length, length, a lateral orientation method besides [ which performs a publicly known method for example, vertical extension, and lateral orientation in order ] the serial biaxial-stretching method, can be adopted, and it is chosen according to various characteristics demanded, such as intensity and dimensional stability. Heat setting processing, vertical relaxation processing, horizontal relaxation processing, etc. can be performed.

[0009]What blended a proper quantity of publicly known antioxidants, sprays for preventing static electricity, etc. can be used for the syndiotactic polystyrene system polymer used for this invention if needed. Ten or less weight % of loadings is desirable to 100 weight % of syndiotactic polystyrene system polymers. Since it will become easy to cause a fracture at the time of extension and will become poor [ production stability ] if 10 weight % is exceeded, it is not desirable.

[0010]How to extend after joining a syndiotactic polystyrene system polymer and the resin composite for

surface formation by the inside of a die, or the opening of a die as a formation method of a surface layer where melting is carried out, laminating, extruding and quenching from a die and creating a formless sheet, After coating the resin composite for surface formation on the formless sheet which extrudes a syndiotactic polystyrene system polymer from a die, and might be quenched, or the film which carried out uniaxial stretching, the method of extending further, the method of carrying out of pasting up and piling up the film extended independently, respectively, etc. are mentioned.

[0011]As polyester system resin laminated by the syndiotactic polystyrene system of this invention, A polyester system polymer, polyester system copolymers, those mixtures, etc. are used, and each dicarboxylic acid of aromatic series, aliphatic series, and alicycle fellows is used as the dicarboxylic acid component. As aromatic dicarboxylic acid, it is terephthalic acid, isophthalic acid, orthophthalic acid, and 2 and 6. - naphthalene dicarboxylic acid etc. can be mentioned. The mechanical strength and water resisting property of polyester system resin fall that it is preferred that it is more than [ of a total dicarboxylic acid component ] 40 mol % as for these aromatic dicarboxylic acid, and it is less than [ 40 mol % ]. As dicarboxylic acid of aliphatic series and alicycle fellows, it is succinic acid, adipic acid, sebacic acid, and 1,3. - cyclopentane dicarboxylic acid, and 1 and 2 - cyclohexanedicarboxylic acid, and 1 and 3 - cyclohexanedicarboxylic acid etc. are mentioned. If the dicarboxylic acid of aliphatic series and alicycle fellows is added, adhesion performance may be improved, but generally the mechanical strength and water resisting property of a polyester copolymer fall.

[0012]as a glycol component -- the aliphatic series glycol of 2-8 carbon numbers, and the carbon numbers 6-12 -- it being a mixture of this alicycle fellows glycol and both \*\*, and, Ethylene glycol and 1,2 - propylene glycol and 1,3 - propanediol, 1,4 - butanediol, neopentyl glycol, and 1,6 - hexandiol and 1,2 - cyclohexane dimethanol and 1,4 - cyclohexane dimethanol, p - xylylene glycol, etc. are mentioned. Carbon number 4 A diethylene glycol, triethylene glycol, etc. are mentioned as aliphatic series diol more than an individual, and a polyethylene glycol, a polypropylene glycol, a polytetramethylene glycol, etc. are mentioned as polyether.

[0013]Polyester system resin is obtained by the usual melt polycondensation. Namely, after carrying out the direct reaction of an above-mentioned dicarboxylic acid component and glycol component and distilling off and esterifying water, The direct esterification process which performs a polycondensation, or the dimethyl ester and the glycol component of a dicarboxylic acid component are made to react, and after distilling off methyl alcohol and performing an ester interchange, it is obtained by the ester interchange method for performing a polycondensation. In addition, a polymer is obtained also by the solution polycondensation method or an interfacial polycondensation method. In this invention, it is not limited to the method of one of the above. In the case of melt polycondensation, an antioxidant, a sliding agent, inorganic particles, and a spray for preventing static electricity can be added if needed. The polyether mentioned above can be blended and added after a polymerization in the case of melt polycondensation.

[0014]The surface layer which becomes at least one side of the film which the laminated film of this invention turns into from the styrene system polymer which has syndiotactic structure from a polyester system polymer is formed. By forming the surface layer which consists of a polyester system polymer, the moisture resistance at the time of a voltage overload and self healing nature become good, and it is \*\*. Since polyester system resin has the comparatively good electrical property, its influence which it has on the temperature and the frequency dependence of the very good electrical property which a syndiotactic

polystyrene system polymer has is small.

[0015] And the aforementioned three-dimensional surface roughness Slambdaa and SRa are adjusted by the film production conditions of a film, a projection formation agent, lamination, etc. The kind and addition of a projection formation agent are not limited especially if the three-dimensional surface roughness Slambdaa and SRa go into the predetermined range, but. For example, addition of the particles etc. which consist of organic polymers, such as a salt of metal, such as metallic oxides, such as silica, a titanium dioxide, talc, kaolinite, and zeolite, calcium carbonate, calcium phosphate, and barium sulfate, or silicone resin, and bridge construction polystyrene, is illustrated. And although any one sort may be independently used for these particles and two or more sorts may be used together, 0.01 micrometers or more 2.0 micrometers or less, below 0.05-micrometer or more 1.5  $\mu\text{m}$  of especially the average particle system of the particles to be used is preferred, and the degree of dispersion of particle diameter (ratio of standard deviation and mean particle diameter) is [ 25% or less of ] preferred. an addition receives syndiotactic polystyrene system polymer 100 weight % -- 0.005 -- more than weight % -- 2.0 -- it is preferred that below weight % contains -- especially -- 0.1 -- more than weight % -- 1.0 -- below weight % is preferred.

[0016] 0.01 micrometers or more of three-dimensional surface roughness SRa of a surface layer of a syndiotactic polystyrene system laminated film of this invention are 0.02 micrometers or more still more preferably. When SRa is smaller than 0.01, since performance traverse at the time of manufacture of a film and capacitor manufacture becomes poor, it is not desirable. Three-dimensional surface roughness It turned out that Slambdaa controls omission of lubricant at the time of a run of a film, and capacitor manufacture, and differs in optimal range for using a thing excellent in performance traverse, and it is necessary to make it into following within the limits with glass transition temperature of a laminated film.  $4+4 \times (T_{\text{ge}} - T_{\text{gc}}) / T_{\text{ge}} \leq \text{Slambdaa} \leq 25+10 \times (T_{\text{ge}} - T_{\text{gc}}) / T_{\text{ge}}$  -- here, The glass transition temperature  $T_{\text{gc}}$  of polyethylene terephthalate of  $T_{\text{ge}}$  is the glass transition temperature of a surface layer. Performance traverse becomes poor when Slambdaa becomes less than  $4+4 \times (T_{\text{ge}} - T_{\text{gc}}) / T_{\text{ge}}$ . When Slambdaa becomes larger than  $25+10 \times (T_{\text{ge}} - T_{\text{gc}}) / T_{\text{ge}}$ , since face powder in accordance with the ability to delete a projection arises and it becomes poor [ abrasion resistance ], it is not desirable.

[0017] In this invention, it turned out that influence which it has on electric capacity of a laminated film, or temperature and a frequency characteristic of a dielectric dissipation factor with thickness of a surface layer needs to make glass transition temperature of a surface layer following within the limits in things.

$T_{\text{gc}} \geq 50 \times (1 + A_e / A)$  -- here --  $A_e$  -- thickness  $A$  of a surface layer -- the thickness  $T_{\text{gc}}$  of a laminated film --  $50 \times (1 + A_e / A)$  -- in the following, since a case where temperature and the frequency characteristic of the electrical property of a capacitor become poor increases, it is not desirable. As for thickness of a surface layer, in this invention, it is preferred that it is 30% or less of the thickness of a laminated film. Since electrical properties, such as electric capacity, temperature of a dielectric dissipation factor, and a frequency characteristic, and heat resistance become poor in being thicker than 30%, it is not desirable. Although not limited in particular for a minimum of thickness, since the improvement effect of self healing nature will become is hard to be acquired if it becomes thinner than 0.005  $\mu\text{m}$ , it is not desirable.

[0018] The dielectric dissipation factor (25 \*\*, 1 kHz) of the laminated film in which the surface layer was laminated by at least one side of the film which consists of a styrene system polymer which has syndiotactic structure in this invention is 0.001. It is preferred that it is the following. When a dielectric dissipation factor (25 \*\*, 1 kHz) becomes larger than 0.001, since the good electrical property which the

film which consists of a syndiotactic polystyrene system polymer has serves as a spoiled thing, it is not preferred by having been influenced by the characteristic of polyester system resin of the laminated surface layer.

[0019]The capacitor using the metalization syndiotactic polystyrene system laminated film which formed the metallic thin film layer at least in one side of these laminated films in this invention, The variation in the characteristic of the capacitor obtained since omission of lubricant in a capacitor manufacturing process were controlled and it excelled in performance traverse decreases, and yield improves. The obtained capacitor serves as a thing in which the moisture resistance at the time of a voltage overload and self healing nature were improved.

[0020]

[Working example]Although an embodiment explains this invention concretely below, this invention is not limited only to these embodiments. The valuation method of a film is shown below.

[0021](1) Three-dimensional surface roughness A sensing pin type three-dimensional surface roughness meter (SE-3AK, Kosaka Laboratory [, Ltd. ], Ltd. make) is used for Slambdaa and a SRa film surface, It measures over the measurement length of 1 mm by the cutoff value of 0.25 mm at the longitudinal direction of a film to conditioning of 2 micrometers in radius of a needle, and 30 mg of load, and is 500 at a 2-micrometer pitch. It divided into the point and the height of each point was made to incorporate into a three-dimensional granularity analysis device (SPA-11). It is the same operation as this continuously [ at intervals of 2 micrometers ] about the cross direction of a film 150 It carried out over 0.3 mm of cross direction of a time, i.e., a film, and data was made to incorporate into an analysis device. next, an analysis device is used -- Slambdaa and SRa were calculated.

[0022](2) Using glass-transition-temperature physical science electrical-and-electric-equipment incorporated company make THERMOFLEX DSC-8230, a heating rate was measured by a part for 20 \*\*/, and sample weight was measured on 5-mg conditions.

[0023](3) A dielectric dissipation factor at 25 \*\* and 1 kHz was evaluated using dielectric dissipation factor YOKOGAWA and 4192 A LF IMPEDANCE ANALYZER by Hewlett Packard Co.

[0024](4) It is considered as tape shape which carried out the slit of the performance traverse of a film, and the \*\*\*\*\*-proof film to a narrow width, Rubbed this to metal guide rolls, are a high speed and it was made to run for a long time, and five steps were evaluated and some of amounts of white complications generated on size of tape tension after this guide roll scratch and the surface of a guide roll were ranked, as shown below, respectively.

(\*\*) The 1st class of performance traverse; tension size (there are many in an abrasion emergency)

2nd class; -- \*\*\*\* -- a little -- a large (an abrasion -- there are many)

The 3rd class; inside of tension (hello an abrasion and \*\*)

4th class; -- \*\*\*\* -- a little -- small (with none of most abrasions)

The 5th class; tension smallness (with no abrasion generating)

(\*\*) 1st [ \*\*\*\*\*-proof ] class; -- generating of white complications -- extraordinary -- many 2nd class; white complications -- generating -- generating of many 3rd class; white complications -- hello, with no generating of 5th generating-\*\*\*\*-less class; white complications of the 4th class of \*\*; white complications [0025](5) A damp-proof capacitor at the time of a voltage overload under atmosphere of 60 \*\* and 95%RH, Voltage of 100V (DC) was impressed, it aged for 1000 hours, and a rate of capacity changes was measured using

YOKOGAWA and 4192 A LF IMPEDANCE ANALYZER by Hewlett Packard Co. this -- deltaC /C (%) shows and this rate of capacity changes is small -- it is and forge-fire moisture resistance is good. Here, it is the value in which C subtracted electric capacity before aging and deltaC subtracted electric capacity after aging from electric capacity before aging. Five steps were evaluated and a judgment was ranked, as shown below.

1st class; --2nd [ -20>deltaC /C] class; -10>deltaC /C >=-203 class; -5 >deltaC /C >=-104 class; 0>deltaC /C >=-55 class; deltaC /C >=0 [0026](6) Self healing nature (SH nature)

The laminated film which vapor-deposited aluminum of thickness 600 \*\* in one side was cut in one-side square of 1 cm, and was piled up two sheets, and also it inserted into one-side a 2-cm rubber plate, and 2 kg of load was applied. In this state, voltage was impressed to the deposition film, the dielectric breakdown was generated, and 20 measurement sizes estimated the existence of self healing nature.

1st class; -- 2nd [ self-healing-nature-less ] class; -- self healing nature -- 3rd [ which is not most ] class; -- the case where there is no self healing nature -- 4th [ \*\*\*\* ] class; -- most self healing nature -- 5th [ \*\*\*\* ] class; -- all self healing nature -- \*\*\*\* [0027](7) 150 \*\* and the dielectric dissipation factor at 1 kHz estimated using temperature-characteristics YOKOGAWA and 4192 ALF IMPEDANCE ANALYZER by Hewlett Packard Co. Five steps were evaluated and the dielectric dissipation factor was ranked, as shown below.

2nd [ or more / the class / 1st /; / 0.05 ] class;0.01 - 0.053rd class;0.005 - 0.014th class;0.001 - 0.0055th class;0.001 -- the following [0028]Embodiments 1 and 2 Adjustment BAIRO knurl MD1200 (made by TOYO BOSEKI KABUSHIKI KAISHA) 20 weight section of the comparative example 1 (a) polyester aqueous solution (25% of solid content)

Water 36 weight-section isopropyl alcohol 36 weight-section benzyl alcohol 8 weight section[0029](b) Manufacture syndiotactic polystyrene (weight average molecular weight 250000) 100 of a laminated film As opposed to a weight section, A polymer chip which added 4.0 weight sections of polyethylene terephthalate (IV=0.62) resin which contains a calcium carbonate particle (mean particle diameter = 1.0 micrometer, degree of dispersion =20 %) 35weight % as a projection formation agent, A polymer chip with which a projection formation agent is not added 0.2 opposite 9.8 (comparative example 1), 0.5 After mixing at the pair 9.5 (Embodiment 1) and a rate of 1 to 9 (Embodiment 2), it dried, melting was carried out by 300 \*\*, it extruded from a T die of a lip gap of 200 mum, adhesion and cooling solidification made it a 40 \*\* cooling roller by the electrostatic \*\*\*\* method, and a 44-micrometer formless sheet was obtained. preheating this formless sheet to 100 \*\* with a roll first, and heating further an infrared heat heater of skin temperature 700 \*\* by 4 use -- film temperature 139 \*\* -- a lengthwise direction -- 2.0 -- double-extending -- 125 \*\* -- a lengthwise direction -- 1.8 -- it double-extended. Coating liquid obtained above (a) to this uniaxial stretched film was applied to both sides by the bar coat method. Subsequently, by a tenter, a film is preheated to 120 \*\*, and it extends 2.0 times by extension temperature 120 \*\* in a transverse direction, and also is 1.6 at 150 \*\*. After extending in a double transverse direction, heat setting was carried out by 260 \*\*. The sum total of thickness of 4 mum and a surface layer was 0.1 mum, and thickness of the obtained whole laminated film was uniform application membrane. On a spreading side of an obtained film, 500A of aluminum was vapor-deposited and a wound type film capacitor was made as an experiment. A film and the capacitor characteristic are shown in Table 1.

[0030]Comparative example 2 syndiotactic-polystyrene (weight average molecular weight 250000) 100 As

opposed to a weight section, It is a calcium carbonate particle (mean particle diameter = 1.0 micrometer, degree of dispersion =20 %) as a projection formation agent 3.5 A polymer chip which carried out weight section addition, It carried out like Embodiment 1 except having mixed and used a polymer chip with which a projection formation agent is not added at a rate of 0.5 opposite 9.5 by a weight ratio. 500 \*\* vacuum evaporation of aluminum was done on a spreading side of an obtained film, and a wound type film capacitor was made as an experiment. A film and the capacitor characteristic are shown in Table 1.

[0031]Embodiments 3 and 4 Comparative example 3 syndiotactic polystyrene (weight average molecular weight 250000) 100 As opposed to a weight section, It is a calcium carbonate particle (mean particle diameter = 1.0 micrometer, degree of dispersion =20 %) as a projection formation agent 3.5 A polymer chip which carried out weight section addition, What mixed a polymer chip with which a projection formation agent is not added at a rate of 1 to 9 by a weight ratio, Polyethylene terephthalate (IV=0.62) which does not contain a projection formation agent as a surface layer is supplied to a respectively separate extruder, Melting was carried out, it joined so that polyethylene terephthalate might form both surface layers in a T die, and it extruded from a T die of a lip gap of 200 mum, adhesion and cooling solidification made it a 40 \*\* cooling roller by the electrostatic \*\*\*\* method, and a 44-micrometer formless lamination layer sheet was obtained. It was made for the sum total of thickness of a surface layer to be set to 5 micrometers (Embodiment 3), 11 micrometers (Embodiment 4), and 14 micrometers (comparative example 3) here. preheating this formless sheet to 100 \*\* with a roll first, and heating further an infrared heat heater of skin temperature 700 \*\* by 4 use -- film temperature 139 \*\* -- a lengthwise direction -- 2.0 -- double-extending -- 125 \*\* -- a lengthwise direction -- 1.8 -- it double-extended. Coating liquid obtained above (a) to this uniaxial stretched film was applied to both sides by the bar coat method. Subsequently, by a tenter, a film is preheated to 120 \*\*, and it is extension temperature 120 \*\* in a transverse direction, and is 2.0. After double-extending and also extending in a 1.6 double transverse direction by 150 \*\*, heat setting was carried out at 260 \*\*. Thickness of the obtained whole laminated film was 4 micrometers. 500 \*\* vacuum evaporation of aluminum was done on a spreading side of an obtained film, and a wound type film capacitor was made as an experiment. A film and the capacitor characteristic are shown in Table 1.

[0032]Embodiments 5 and 6 Comparative example 4 syndiotactic polystyrene (weight average molecular weight 250000) 100 As opposed to a weight section, It is a calcium carbonate particle (mean particle diameter = 1.0 micrometer, degree of dispersion =20 %) as a projection formation agent 3.5 The polymer chip which carried out weight section addition, What mixed the polymer chip with which a projection formation agent is not added at a rate of 1 to 9 by the weight ratio, Polyethylene 2 and 6 which does not contain a projection formation agent as a surface layer - tele naphthalate (embodiment 5), As carboxylic acid components, terephthalic acid 50 weight section and isophthalic acid 50 weight section, It is ethylene glycol, 1, and 4 as a glycol component. The resin (Embodiment 6, comparative example 4) which changes the composition ratio of - cyclohexane dimethanol and in which glass transition temperature differs is supplied to a respectively separate extruder, Melting was carried out, it joined so that polyethylene terephthalate might form both surface layers in a T die, and it extruded from the T die of the lip gap of 200 mum, adhesion and cooling solidification made it a 40 \*\* cooling roller by the electrostatic \*\*\*\* method, and a 44-micrometer formless lamination layer sheet was obtained. It was made for the sum total of the thickness of a surface layer to be set to 1.0 mum here. This formless sheet is first preheated to 100 \*\* with a roll, the infrared heat heater of skin temperature 700 \*\* is further heated by 4 use, and it is 2.0 to a lengthwise

direction at film temperature 139 \*\*. It double-extended and also extended 1.8 times to the lengthwise direction by 125 \*\*. The coating liquid obtained above (a) to this uniaxial stretched film was applied to both sides by the bar coat method. Subsequently, by a tenter, a film is preheated to 120 \*\*, and it extends 2.0 times by extension temperature 120 \*\* in a transverse direction, and also is 1.6 at 150 \*\*. After extending in a double transverse direction, heat setting was carried out by 260 \*\*. The thickness of the obtained whole laminated film was 4 micrometers. 500 \*\* vacuum evaporation of aluminum was done on the spreading side of the obtained film, and the wound type film capacitor was made as an experiment. The characteristic of a film and a capacitor is shown in Table 1.

[0033]

[Table 1]

|      | T <sub>gs</sub><br>℃ | S <sub>Ra</sub><br>μm | S <sub>λa</sub><br>μm | 厚み比<br>% | 誘電正接<br>0.0005 | 走行性<br>級 | 耐前れ性<br>級 | 耐湿性<br>級 | SH性<br>級 | 温度特性<br>級 |
|------|----------------------|-----------------------|-----------------------|----------|----------------|----------|-----------|----------|----------|-----------|
| 比較例1 | 67                   | 0.009                 | 8.4                   | 2.5      | 0.0005         | 2        | 3         | 5        | 4        | 5         |
| 実施例1 | 67                   | 0.014                 | 9.0                   | 2.5      | 0.0005         | 3        | 4         | 5        | 4        | 5         |
| 実施例2 | 67                   | 0.035                 | 9.5                   | 2.5      | 0.0005         | 4        | 5         | 5        | 4        | 5         |
| 比較例2 | 67                   | 0.041                 | 20.4                  | 2.5      | 0.0005         | 5        | 2         | 5        | 3        | 5         |
| 実施例3 | 69                   | 0.037                 | 17.3                  | 11.4     | 0.0006         | 5        | 4         | 4        | 5        | 4         |
| 実施例4 | 69                   | 0.030                 | 12.3                  | 25.0     | 0.0008         | 5        | 5         | 4        | 5        | 3         |
| 比較例3 | 69                   | 0.022                 | 7.0                   | 31.8     | 0.0011         | 4        | 4         | 4        | 5        | 2         |
| 実施例5 | 113                  | 0.029                 | 12.1                  | 25.0     | 0.0007         | 4        | 5         | 4        | 4        | 4         |
| 実施例6 | 65                   | 0.028                 | 10.2                  | 25.0     | 0.0008         | 3        | 4         | 4        | 5        | 3         |
| 比較例4 | 62                   | 0.026                 | 10.1                  | 25.0     | 0.0008         | 3        | 4         | 4        | 5        | 2         |

Table 1 The film obtained in Embodiments 1-6 was the syndiotactic polystyrene system laminated film and capacitor by which it excelled in the performance traverse of the film at the time of manufacture of a film, and capacitor manufacture, and \*\*\*\*\*-proof, and the moisture resistance at the time of a voltage overload and self healing nature were improved more.

[0034]

[Effect of the Invention]As mentioned above, by this invention, the composition as a description is adopted as said Claims as a description.

Therefore, the syndiotactic polystyrene system laminated film and capacitor by which it excelled in the performance traverse of the film at the time of manufacture of a film and capacitor manufacture and \*\*\*\*\*-proof, and the moisture resistance at the time of a voltage overload and self healing nature were improved are provided, therefore industrial worth of this invention is size.

[Translation done.]